

**SECURITIZATION AND BANKS'  
CAPITAL STRUCTURE**

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## SECURITIZATION AND BANKS' CAPITAL STRUCTURE

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## **Abstract**

Asset securitization offers banks the possibility of altering their capital structures and the financial intermediation process. This study shows that the introduction of securitization is associated with fundamental changes in the funding policies of banks. In particular, we present evidence of more intense use of securitization by banks (i) with stronger growth opportunities; (ii) with liquidity constraints; (iii) with costlier alternative sources of funding; and (iv) with restricted access to capital markets owing to adverse selection. Securitization is also observed to be higher on the pecking order of financing choices of small and medium-sized banks and non-listed banks, which are likely to face more severe adverse selection problems.

**Keywords:** securitization, capital structure, adverse selection, pecking order.

**JEL Classification:** G32, G21.

## **Resumen**

La titulización de activos ofrece a los bancos la posibilidad de alterar su estructura de capital y el proceso de intermediación financiera. Este trabajo muestra que la introducción de la titulización está asociada con cambios fundamentales en la política de captación de fondos de los bancos. En particular, presentamos evidencia de un uso más intenso de la titulización por parte de los bancos i) con mayores oportunidades de crecimiento, ii) con restricciones de liquidez, iii) con alternativas más costosas de financiación, y iv) con restricciones de acceso al mercado de capital debido a la selección adversa. Se observa también en este trabajo que la titulización ocupa un lugar importante en el orden de prelación en la elección de fuentes de financiación de los bancos medianos y pequeños y de los no cotizados, que son los que probablemente tienen problemas de selección adversa más severos.

**Palabras clave:** titulización, estructura de capital, selección adversa, orden de prelación en la financiación.

**Códigos JEL:** G32, G21.

## 1 Introduction

How does the introduction of securitization affect banks' operations and financing choices? Asset securitization expands the financing possibilities of banks by allowing the transformation of illiquid assets on bank balance sheets, e.g., mortgage loans, into marketable securities. Banks can use this financial innovation to fund asset growth and also to alter their capital structures, with securitizations substituting for more traditional liabilities such as bank deposits. Indeed, securitization is a financial innovation that fundamentally affects the financial intermediation process performed by banks and is reflected on the asset and liability sides of banks' balance sheets.

The financial literature has studied some determinants of the expansion of securitization, such as the corporate-taxation advantages in Pennacchi et al. (2014), and has also examined its effects on banks' operations, credit standards and credit expansion, e.g., Loutskina and Strahan (2009) and Loutskina (2011).<sup>1</sup> However, the literature has not studied in detail how securitization changes the financing choices and capital structure of banks, which is the focus of this paper.

Using data from the Spanish banking system during the period 1988-2006 we empirically examine a series of hypothesis on the effects that securitization may have produced on banks' capital structures. We motivate these hypotheses with insights from traditional theories of capital structures in corporate finance; namely the trade-off and the pecking order theories, (Myers 1984, and Myers and Majluf 1984). In particular, as suggested by the trade-off theory we assume that there is an optimal capital structure for each bank, which is potentially affected when access to a new financing possibility (securitization of assets in our case) becomes available. Based on this simple insight, we test hypotheses that consider whether securitization will be used more intensively by (i) those banks with more profitable uses for new funds and (ii) those banks for which access to other financing sources was restricted or particularly costly. Furthermore, motivated by the logic of the pecking order theory we examine the position securitization takes in the pecking order of bank financing choices and relate that to the adverse selection effects that banks may experience when issue securities.

The Spanish banking system provides an ideal framework for studying securitization as a shock on the availability of bank financing alternatives for several reasons. While in other countries, such as the United States, securitization developed progressively beginning in the early eighties; in Spain the process can be better described as a regime shift. Only after several legal changes that occurred in 1998 could banks effectively consider securitizing their assets.<sup>2</sup> The sample period ends in 2006, just before the financial crisis has removed loan securitization as a funding possibility for banks.<sup>3</sup> In addition, securitization was promptly embraced by Spanish banks which, on average, proceeded to securitize a substantial part of

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1. See also Keys et al. (2010), Purnanandam (2011), and Demyanyk and Van Hemert (2011), who provide evidence on the relation between deterioration of loan quality and securitization. Other relevant references on this topic include Pais Rodriguez (2005, 2009), Mian and Sufi (2009) and Jiménez et al (2010). There is also evidence that securitization does not necessarily worsen adverse selection problems, as shown by Benmelech et al. (2012) for the securitization of corporate loans.

2. The securitization period began in 1999, when the euro was adopted, facilitating firms' access to European capital markets. Bris, Koskinen and Nilsson (2009) show a reduction of firms' cost of capital after 1999.

3. Since mid-2007, Spanish banks have only carried out securitization operations to obtain liquidity from the ECB. Private investors have refused to participate with new funds in this securitization market.

their assets (e.g., more than 25% of their mortgages).<sup>4</sup> Finally, the Spanish banking system includes entities of different characteristics in terms of their access to finance, which provides a useful source of exogenous variation for our tests. In particular, this heterogeneity provides a useful framework to study the extent to which securitization might overcome adverse selection in capital markets.

Our study is organized into three main parts. In the first part, we provide a descriptive analysis of (i) the differences between the capital structure of Spanish banks before 1999 and at the end of 2006, (ii) the relation of securitization with the decoupling of lending and deposit activities of banks, and (iii) the changes in banks' funding policies and the role of securitization as a source of funds.<sup>5</sup> We examine in particular the different roles of deposits in the Spanish credit expansions of 1988-1991 (pre-securitization period) and 1998-2006 (post-securitization period).

The second part of this study examines the determinants of securitization. Motivated by our premise that securitization affects the optimal mix of financing sources, we examine whether securitization is used more intensively by those banks with higher growth opportunities, higher financial costs of alternative sources of funds and lower costs of securitization. We consider several aspects of the securitization process including whether or not banks used securitization, but also the loan amounts securitized and time until the first use of securitization.

In the third part we examine how securitization fits in the pecking order of financing choices by banks. As bank balance sheets are opaque (Morgan, 2002), adverse selection can impose greater discounts on the debt and equity issuances of banks than on financial securities issued by nonfinancial firms. Furthermore, the sale of individual bank loans and pools of assets (with no tranching)<sup>6</sup> can also be subject to large discounts, because banks have private information<sup>7</sup> on borrowers' conditions (DeMarzo, 2005; DeMarzo and Duffie, 1999). In this context, banks might raise new funds at a lower cost through securitization because the process of pooling and tranching loans has the potential to reduce informational asymmetries (DeMarzo, 2005). To examine the securitization decision we modify the pecking order equation<sup>8</sup> in Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) and explore whether banks are likely to first choose securitization over other sources of funds and if this effect is more pronounced when they face more severe adverse selection problems (Bharath et al., 2009).

There are a number of findings that emerge from our analysis. First, loan securitization is associated with substantial changes in the liability structure of banks. In particular, the use of securitization is associated with lower reliance on deposits to finance the

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4. During the study period Spanish banks became the second largest issuers in Europe of ABS (after British banks) and of covered bonds (after German banks).

5. From 2005 onwards, International Financial Reporting Standards (IFRS) forced Spanish banks to keep in their balance sheets securitized loans unless a *substantial* part of the risk and profits of these securitizations had been transferred. In practice, banks held more than 90% of their securitized loans on their balance sheets. We keep track of all the securitized loans. In order to homogenize the data and facilitate comparisons, we add back into bank balance sheets any securitized loan pool that was off-balance-sheet during the sample period.

6. See the seminal article by Pennacchi (1988) on the process of selling loans and its associated risks. Drucker and Puri (2009) document substantial growth in the U.S. secondary loan market in spite of informational problems (a growth rate of 25% from 1991 to 2006 has led to a market size of \$236.6 billion in 2006).

7. Adverse selection can be reduced by the presence of implicit agreements, as in Gorton and Pennacchi (1995), and restrictive covenants, as in Drucker and Puri (2009). In collateralized loan obligations (CLO), adverse selection can be reduced because securitized loans are fractions of syndicated loans, and reputation as well as the stake of lead's bank, reduce information asymmetries (Benmelech et al., 2012).

8. Frank and Goyal (2008) provide a survey of the literature of the pecking order theory.



expansion of bank credit. These changes in the liability structure are more apparent for banks that face severe adverse selection problems and have restricted access to financial markets. Second, securitization is used more frequently by banks with stronger growth opportunities, higher relative cost of financing alternatives and tighter liquidity constraints. Bank size is positively associated with securitization, but large banks also make above-average use of equity and debt financing. In relative terms, securitization represents a higher proportion of external funds for smaller and medium-size banks. Securitization also tends to be higher in the pecking order of financing choices of small- and medium-size banks and non-listed banks, which are likely to face more severe adverse selection problems.

The existing literature on bank capital structure generally considers theoretical frameworks focused on the combination of lending and deposit activities.<sup>9</sup> In this traditional banking setting, earlier articles have studied the impact of market conditions and asymmetric information on the optimal financial structure of banks, e. g., Gatev et al. (2009), Gatev and Strahan (2006), Diamond and Rajan (2001), Flannery (1994) and Calomiris and Kahn (1991). By contrast, this study focuses on a banking setting in which securitization is a relevant source of funds and new loans can be financed without the need of bank deposits, as found in Loutskina (2011). For this alternative banking model, we analyze how securitization affects the optimal asset composition and capital structure of banks. This analysis contributes to the literature exploring how securitization has changed traditional banking, e. g., Mian and Sufi (2009), Loutskina and Strahan (2009), Parlour and Plantin (2008) and Greenbaum (1987). Our work is also related to Cornett et al. (2011), who find a negative relation during the recent financial crisis between securitization and both bank holdings of liquid assets and bank lending. We find that securitizing banks expanded loans and reduced holdings of liquid assets more aggressively than other banks during the financial boom, indicating that the results in Cornett et al. (2011) are not only specific to the financial crisis.

The rest of the paper is organized as follows. Section 2 details the characteristics of the data used. Section 3 describes the effects of the introduction of securitization on banks' capital structures. Section 4 analyzes banks' securitization decisions with regression models. Section 5 examines the position of securitization in the hierarchy of financing sources of banks. Section 6 concludes the paper.

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9. Strahan (2008) provides a summary of the different banking theories that explain the rationale for the combination of lending and deposit activities inside the banking firm.

## 2 Data and Sample Characteristics

We collect data on securitized loan issuances of Spanish banks from 1999 to 2006, covering a period of active participation of Spanish banks in securitization activities. Before 1999, financial regulation limited the possibilities of Spanish banks to use loan securitizations. After 2006, the lack of liquidity in securitization markets prevented new issuances of securitized loans.

We use the term “bank” to refer to all forms of depository institutions, including (i) commercial banks, (ii) savings banks (i.e., “*cajas*”) and (iii) credit cooperatives. Banks differ in their ownership structure, governance and organizational purpose. Commercial banks are for-profit corporations owned by their shareholders. Savings banks are nonprofit organizations controlled by local and regional governments. Credit cooperatives are entities owned by a fraction of their depositors and have as their main objective to provide credit to them. Historically, (i.e., before 1999) commercial banks raised external funds through different sources (i.e., issuance of equity and debt securities), rather than being restricted to use only bank deposits while, by contrast, savings banks and credit cooperatives were mostly limited to funding through bank deposits.

Our sample consists of the population of Spanish banks, which ranges from 212 banks in 1999 to 179 entities in 2006.<sup>10</sup> In 1999 (2006), the sample includes 72 (51) commercial banks, 48 (45) savings banks and 92 (83) credit cooperatives. The reduction in the number of banks is due to mergers and consolidation processes.<sup>11</sup>

Loan securitizations by Spanish banks include both issuances of securities backed by a particular portfolio of loans, which can be either mortgages (MBS or mortgage backed securities) or other types of loans<sup>12</sup> (ABS or asset backed securities), and issuances of covered bonds (*cédulas hipotecarias* in the original Spanish name). Issuances of MBS and ABS are initiated with the sale of a portfolio of loans from the originating bank to a special purpose vehicle (SPV), which then issues the MBS or ABS to investors in exchange of funds that are transferred to the originating bank. Typically, the originating bank also services the loan portfolio (i.e., receives the monthly payments, addresses arrears, etc.). Before 2005, regulation allowed banks to remove all the loans in MBS/ABS from their balance sheets, with the corresponding reduction in capital requirements. However, after 2005, a new accounting rule imposed on banks stricter requirements to remove securitized loans.<sup>13</sup> Specifically, after 2005, Spanish banks can reduce regulatory capital requirements by issuing MBS/ABS only if these operations actually transfer credit risk out of their balance sheets. Regulatory recognition of risk transfers requires that banks do not provide SPVs with credit enhancements, which compensate investors in the event of losses in the securitized portfolio.

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**10.** We exclude branches of foreign banks, which have a negligible presence in retail banking in Spain.

**11.** When banks merge, we consider them as separate entities before the merger and as a unique bank after the merger.

**12.** Until 2004, banks only securitized mortgages (MBS) or issued covered bonds. From 2004 to 2006, MBS and securitization of covered bonds are still predominant, but banks started to issue ABS backed by auto loans, consumer loans, SME loans, loans to large firms and loans to the public sector.

**13.** See the Appendix for more details on the change of requirements considered in the new regulation (Circular Banco de España CBE 4/2004).

A covered bond is secured not only by the full credit of the originating bank, but also by an eligible mortgage portfolio that acts as its specific collateral.<sup>14</sup> Two regulatory requirements limit the issuance of covered bonds: (i) The eligible portfolio of collateralized loans can only include loans with a loan to value (LTV) less than 80%; and (ii) the amount securitized must be less than 80% of the value of the eligible portfolio (i.e., overcollateralization requirement). It is worth noting that the issuance of covered bonds has no immediate effect on regulatory capital. Eligible loans that back the covered bond remain in the originating bank's balance sheet and required regulatory capital stays constant.

From 2001 onwards, some groups of small banks securitize loans by first issuing covered bonds and then transferring those covered bonds to a joint SPV, which then issues bonds to investors. Small banks benefit from this multiple-bank securitization procedure, which improves the diversification of the underlying pool of assets and thus attracts additional investors. In our analysis, we consider the regular issuances of covered bonds and multiple-bank securitization as comparable in terms of the securitization decision, because they have similar economic and regulatory implications for the originating banks.<sup>15</sup> The main difference between these two forms of securitization is the type of issuer: small and regional banks formed groups and used multiple-bank securitization, whereas larger banks with access to capital markets issued covered bonds directly. From an economic perspective, however, both mechanisms transform illiquid assets stocked in the balance sheet of banks into tradable securities.

We collect banks' financial and accounting information from the confidential statements reported regularly to Banco de España, who is the regulator and supervisor of the Spanish banking system. These statements include bank balance sheets, income statements and statements of regulatory capital collected at the end of each calendar year from 1999 to 2006. Additionally, we gather data on securitization issuances from two sources: (i) information for MBS/ABS is obtained from the brochures provided to investors by request of the Spanish financial market regulator (CNMV); (ii) information for covered bonds is obtained from incomplete partial set of brochures, which we complement with the balance sheet data in the confidential reports to Banco de España.

Table 1 shows the number of banks that securitize for every year and form of bank. Out of the 212 banks that exist at the start of the sample, 103 securitize loans at least once during the sample period. Table 1 also reveals that the amount of securitized loans increases substantially for all types of institutions (e.g., from 1999 to 2006, the amount of securitized loans increases approximately sixteen-fold for commercial and savings banks). The main issuers of securitizations in absolute volume are savings banks and commercial banks. Nonetheless, the securitization activity for credit cooperatives has been non-negligible, reaching a market share of 4.5% in 2006 which is similar to its weight in terms of total assets, 4.2%.

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**14.** This is similar to a secured bond issued by a non-financial corporation, which is guaranteed by both specific collateral and also the credit of the corporation itself.

**15.** By 2006, multiple-bank securitization represented 41% of the total amount of covered bonds issued.

### 3 Securitization and financing choices

In this section, we describe the Spanish banks' financial condition during the period 1988-2006. We compare the banks' conditions in two sub-periods: a) the *pre-securitization* years (from 1988 to 1997) and b) the *post-securitization* years (from 1998 until 2006). As the issuance of securitized loans is viable on a large scale only after 1998, this comparison gives us a first approximation of the effects of securitization on bank behavior. In the post-securitization period, we also compare the banks that use securitization to obtain financing with the banks that do not securitize their loans.

#### 3.1 Securitization and the evolution of balance sheets

We group bank balance sheet accounts in different subcategories. On the asset side, we consider three groups of items: (1) *LOANS*, which measures credit of all maturities granted by a bank to the non-financial sector (i.e., households and firms); (2) *GOVBONDS*, which accounts for the amount of government debt held by a bank; and (3) *INTERBANK*, which reflects a bank's net financial position in the interbank market (i.e., the difference between lent and borrowed funds, including the net position with the central bank). On the liability side, we consider four groups: (1) *OWNFUNDS*, which measures a bank's equity position (i.e., capital, reserves and insolvency funds); (2) *DEBT*, which corresponds to the amount of debt financing issued by a bank in wholesale markets (excluding the interbank market); (3) *DEPOSITS*, which includes traditional demand deposits held by banks and (4) *SEC*, which consists of the sum of securitized instruments issued by a bank. In addition to these items, we calculate a residual account, i.e., *REST*, which is computed as the difference of the assets and liabilities not considered in the other groups described in this paragraph.<sup>16</sup>

A number of stylized facts emerge from the aggregate data of the different groups of bank accounts, which is displayed in Table 2 and in Figure 1. On the asset side, the emergence of securitization is associated with an increase in the weight of *LOANS* with respect to total bank assets, which rises from 68% in 1997 to 84.6% in 2006. By contrast, this weight remains fairly stable in the pre-securitization years. The growing importance of *LOANS* in the balance sheet is achieved at the expense of government debt (*GOVBONDS*), whose weight relative to total bank assets is reduced from 17% in 1997 to 4.1% in 2006.

On the liability side, the start of the securitization period is connected with abrupt changes to the capital structure of Spanish banks. In the pre-securitization period, *SEC* is negligible, whereas *DEBT* and *OWNFUNDS* respectively represent an average of 5.1% and 10.8% of bank liabilities. During these years, bank deposits are the dominant form of bank financing, i.e., the group *DEPOSITS* represents 84.2% of bank liabilities. From 1998 onwards, there is a drastic reduction of bank deposits (*DEPOSITS* amounts to 59.1% of bank liabilities in 2006), an increased reliance on securitization (*SEC* represents 19.8% of bank liabilities in 2006) and, to some extent, on wholesale debt financing (i.e., the weight of *DEBT* with respect to bank liabilities rises to 12.3% in 2006). This reliance on market debt financing was a major shift in the capital structure of Spanish banks and it is analyzed in further detail in section 4.

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<sup>16</sup> More specifically, *REST* includes the following asset side items: other holdings of financial assets (e. g. private fixed-income debt, cash, and derivatives), positions in the bank trading book, corrections for writing-off assets and other asset items. On the liability side, *REST* includes derivatives, other commercial obligations with suppliers, short positions in securities from overdrafts in repo operations and financial guarantees. For a more detailed explanation of all the groups and their components, see the Appendix.

Finally, the contribution of *OWNFUNDS* to bank liabilities is reduced to 8.7% in 2006, revealing a process of leveraging in the post-securitization period that has been also documented in previous studies.

Additional insight is gained from the comparison of the behavior of the banks that issue securitized loans to fund their operations and the banks that do not securitize. Figure 2 shows that the expansion of credit during the post-securitization period is particularly intense for banks that choose to securitize (Figure 2A). These banks increase the weight of *LOANS* relative to total assets by 17.4 percentage points during the post-securitization years (from 67.4% in 1997 to 84.8% in 2006). For banks that do not securitize (Figure 2B), there is however no significant increase in their loan base. While the weight of *LOANS* relative to total assets increases for banks that do not securitize from 75.1% in 1997 to 79.2% in 2006, this variation is not statistically different from zero. In addition, the depletion of the stock of liquid assets (i.e., government debt) is larger for securitizing banks (a decrease from 17.3% in 1997 to 4.1%, significant at 1%) than for those banks that do not resort to securitization (a decrease from 13.5% to 5.2%, significant at 5%).

On the liability side, there are also significant differences between securitizing and non-securitizing banks. Most notably, the reduction of the weight of *DEPOSITS* with respect to total liabilities is particularly intense for securitizing banks, with a decrease from 84.1% in 1997 to 58.6% in 2006 (banks that do not securitize observe a change from 76.9% in 1997 to 73.5% in 2006). This difference occurs because securitizing banks present an average deposit growth rate of 10.6%, which is inferior to the growth rate of 13.6% for the deposits of non-securitizing banks. In addition, securitizing banks use the funds obtained from securitization to substitute for deposits as a source of funds.<sup>17</sup>

### **3.2 Securitization and the reliance on deposits for credit expansion**

Our previous findings suggest that securitization contributes to the decoupling of the deposit and credit activities of financial intermediaries. To further examine this issue, we analyze the relation between credit and deposits in two periods of intense economic expansion in the Spanish economy: (i) the period 1988-1991, when securitization was unfeasible, and (ii) the period 2003-2006, when securitization was fully operative. In the former period, loan growth was limited by the evolution of deposits. In contrast, loans were able to grow in the latter period at a higher pace than deposits because banks had securitization as an additional financing source. It is precisely during an economic expansion when the demand for credit can increase at a higher pace than the volume of deposits.<sup>18</sup> An excessive reliance on deposit funding can left unattended part of the potential demand for credit and preclude an efficient intermediation process.

As Figure 3 indicates, credit growth is more than two times the deposit growth rate in the 2003-2006 period, whereas it follows closely the rate of growth of deposits during the 1988-1991 period. The higher credit growth during the post-securitization period is likely due to a positive effect of securitization on bank credit supply rather than to a higher demand

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<sup>17</sup> Non-securitizing banks relied on debt issuances, which reached up to 15.6% of their assets, to fund their loan expansion. Securitizing banks also issued debt (12.2%), but used securitization more intensely (20.5%).

<sup>18</sup> Cornett et al. (2011) argue that the volume of core deposits might decrease during expansion periods because savers look for higher returns, and it might increase during recessions because deposits are perceived as safe assets. Since Table 2 shows that the volume of total deposits in Spain increases over time, our finding suggests that the recourse to securitization is not just compensating a fall in the volume of deposits, but it can be also due to an expansion of the demand for loans higher than deposit growth.

derived from stronger economic growth. In fact, the average GDP growth rate in the post-securitization period was lower (3.5%) than in the pre-securitization period (4.1%).

We examine more formally the link between deposit and credit growth across individual banks with a set of regressions of credit growth on deposit and GDP growth. Results are reported in Table 3. We consider both OLS and fixed effect specifications and both indicate that the coefficient of deposit growth falls by 40% for the total sample of banks from 1988-1991 to 2003-2006 (from 0.48 to 0.29 in OLS specifications (1) and (3), and from 0.35 to 0.19 in the fixed effects specifications in (2) and (4)). This result shows that the relationship between deposit and credit growth is less intense after banks can securitize, and it is also consistent with the hypothesis that securitization contributes to decouple the credit and deposit activities of banks (Loutskina, 2011; Loutskina and Strahan, 2009).

In Columns (5) to (8) of Table 3, we examine the relation between credit and deposit growth for the subgroups of securitizing and non-securitizing banks. In this analysis, the evidence is less conclusive. Securitizing banks exhibit a relatively low coefficient on deposit growth in the OLS specifications (i.e., 0.30 in (5) relative to 0.47 for non-securitizing banks in (7)). However, we fail to find a stronger relationship between credit and deposit growth for non-securitizing banks once we include fixed effects (i.e., the deposit growth coefficient is 0.27 for securitizing banks in (6) and 0.23 for non-securitizing banks in (8)). A possible reason for these mixed results is that some common factors explain both securitization decisions and the growth rates of loans and deposits, making more difficult the interpretation of coefficients in these simple regressions. To consider this issue and other possibilities, we examine more carefully next the factors that affect banks' securitization decisions.

## 4 The determinants of the securitization decision

We consider insights that emanate from existing theories of capital structure to the case of banking firms in order to derive some testable predictions about their decision to securitize. In particular, we hypothesize that securitization alters the optimal mix of banks' financing choices because it (i) provides a novel source of finance whose attractiveness depends on banks financial choices (*trade-off* theory) and (ii) facilitates the access to market financing of banks facing severe adverse selection problems (*pecking order* theory).

The *trade-off* theory insights are based on the premise that banks that alter their capital structure and decide to securitize are those banks that are financially constrained i.e., that find it relatively more costly to finance investment opportunities with pre-existing sources of funds. In order to identify financially constrained banks, we consider three different dimensions: (i) the relative cost of securitization with respect to other funding alternatives, (ii) the growth opportunities in the banks' loan portfolios, and (iii) the liquidity position of banks. Our hypothesis is that banks whose sources of funds are relatively more expensive, banks with more growth opportunities and banks with tighter liquidity conditions are more likely to benefit from the new financing possibility offered by securitization.

The *pecking order* theory suggests a more specific insight: securitization grants banks access to public market financing without facing an adverse selection high discount. More specifically, securitization mitigates adverse selection since it reduces the informational problems associated with the direct sale of loans or pools of loans (DeMarzo, 2005). To examine the empirical relevance of this insight, we analyze whether banks that are more affected by adverse selection costs are those that resort relatively more to raising market funds through securitization.

The rest of this section presents the variables that are used to proxy for the determinants of securitization among Spanish banks, an explanation of the empirical methodology employed for analysis and the results.

### 4.1 Variables

We distinguish five groups of explanatory variables: (1) proxies related to financing costs, (2) proxies related to liquidity, (3) proxies related to the growth opportunities of banks, (4) variables related to the market access possibilities of banks and (5) other control variables.

#### 4.1.1 FINANCING COSTS

We have argued that the financial benefits of securitization are likely to be larger for banks that are constrained in their investment policy by their inability to resort to other sources of financing such as demand deposits, interbank loans and debt and equity issuances. These constraints could appear in the form of high financing costs associated with available funding alternatives. Banks can benefit from securitization provided that this financing source presents a lower relative financing cost than the existing alternatives.

Since we do not have price information to measure the costs of alternative financing sources, we use the relative amount of financial instruments held by the banks in the pre-securitization period as proxies for the cost of the alternative financing sources. Implicitly this assumes that the observed capital structures of banks are the result of profit-maximizing

strategies that take into account differences in the marginal financial costs of alternative financial sources. For instance, if a bank concentrates its financing in the pre-securitization period in only one source (i.e., deposits), one would expect that this source is particularly inexpensive for the bank (or alternatively that the financing cost of other funding alternatives is relatively higher). In this case, securitization would be less beneficial for banks with highly-concentrated sources of finance, (since this probably reflects the access to a low cost financing source) and would be more beneficial to banks whose capital structure contains a wide set of sources.

In particular, for each bank-year, we consider the following variables for relative financing costs:

(i) *Dep/Loans, Interbank/Loans, Debt/Loans, Equity/Loans*: The ratio of each financing source with respect to total loans provides a measure of the constraints faced by a bank in its credit operations. We consider four possible sources of financing for banks: deposits, net financing from the interbank market,<sup>19</sup> debt and equity. Banks that have better access to one of these funding sources (i.e., low financial costs, better availability of funds, an extensive branch network to access retail deposit markets) will finance a higher proportion of their loan operations with this financing source. We expect that these banks have lower incentives to securitize, because they already have access to a relatively cheap financing source.

(ii) *Concentration*: As an alternative measure of the concentration of financing sources we construct the ratio of the sum of squares of financing sources divided by the square of the sum of all the sources, that is,  $\frac{Interbank^2 + Debt^2 + Equity^2}{(Interbank + Debt + Equity)^2}$ . *Concentration* is

bounded between 1, when a bank has only one source of financing in addition to deposits, and 1/3, when a bank uses the same amount of the three market sources of funds. According to the logic stated above, banks with a dominant financing source will feature a higher *Concentration* measure and should exhibit a lower tendency to securitize. It is important to note that we do not include deposits in this ratio and consider them in the separate variable *Dep/Loans* to isolate the effect of this traditional and large source of bank financing from financing alternatives in public financial markets.

#### 4.1.2 LIQUIDITY

Banks with higher (lower) liquidity constraints are potentially subject to higher investment constraints and, thus, they are more likely to securitize. We use banks liquidity holdings as an inverse measure of their liquidity constraints. Specifically, we consider two variables to describe the liquidity of a bank:

(i) *Liquidity / Loans*: This numerator of this measure consists of the sum of the government debt and the net volume of deposits held in the interbank market, including the net position with the central bank. This definition of liquid assets is similar to the measure suggested in Basel III, i.e., High Quality Liquid Assets in the Liquidity Coverage Ratio, LCR. We expect a negative relation between a bank's incentives to securitize and the ratio of this liquidity buffer with respect to the volume of loans that are to be financed.

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<sup>19</sup>. The net interbank position is defined as  $Max\{Interbank\ Loans - Interbank\ Deposits, 0\}$ .



(ii) *Past profitability / Loans*: This variable is a proxy of the availability of internally generated funds that can be used to finance new loans. This variable is computed as the ratio of the profits of the previous year net of the distributed dividends with respect to the volume of loans to be financed. We expect that banks with higher retained earnings will have lower incentives to securitize.

#### 4.1.3 GROWTH OPPORTUNITIES

Banks with potentially higher growth opportunities are more likely to need financing, and securitization may help to cover this need. In order to capture growth potential, the existing literature suggests the use of the price-to-book ratio (e.g. the Tobin's Q ratio)<sup>20</sup> however, since a very large part of the banks in our sample are non-publicly traded we consider the following alternative proxies:<sup>21</sup>

(i) *Projected Loan Growth*: We estimate a series of projected loan growth (which we identify with banks growth opportunities) that we define as:  $\frac{L_t - L_{t-1}}{A_{t-1}}$ , where  $L_t$  is the

balance of loans at the end of year  $t$ , and  $A_{t-1}$  is the total assets at the end of year  $t-1$ . We use the ratio of the absolute difference of loan balances on year  $t$  and  $t-1$  with respect to total assets on year  $t-1$  to avoid large growth rates caused by small initial loan balances and to be consistent with the rest of variables defined below. Specifically, we estimate an autoregressive model that explains loan growth on year  $t$  as a function of the loan growth on year  $t-1$  and  $t-2$  with a rolling window of 10 years, which avoids differences in standard errors due to the growing number of years for observations that are observed later in the time horizon. For each year after  $t$ , we obtain the best prediction (based on the observed loan growth for years  $t-1$  and  $t-2$ ) of loan growth. The variable loans,  $L_t$ , includes loans to the public sector and loans to non-financial firms and households (both residents and non-residents).

We validate this proxy (i.e., the extent to which it measures bank growth opportunities) by considering its statistical relationship with the Tobin's Q ratio for the subsample of banks whose equity is publicly traded. In particular we regress Tobin's Q using as explanatory variables *Projected Loan Growth* and the rest of the explanatory variables considered in our model of the decision to securitize. We find that *Projected Loan Growth* is statistically significant at 1% while the rest of variables are not significant (OLS with robust standard errors clustered at bank level) and the  $R^2$  amounts to 23%. When *Projected Loan Growth* is the only explanatory variable, the sign, magnitude and statistical significance of the coefficient remains unchanged, and it can explain up to 12% of the total variation of the price-to-book ratio.

(ii) As an alternative proxy for growth opportunities we use *GrowthOpp* i.e., the number of new regional markets in which banks enter to operate and the sum of GDP for the regional markets of bank operations. This alternative proxy is considered in the robustness analysis to test the validity of the results of the main specifications.

#### 4.1.4 MARKET ACCESS

Banks' accessibility to financial markets can affect their use of securitization in different ways. On the one hand, a bank with previous access to the market can use this new financing

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20. See Frank and Goyal (2008) for a review.

21. Savings banks and credit cooperatives are not listed in the Stock Market because of their legal nature. As for commercial banks, only 14 banks out of 51 in our sample were listed in the Stock Market.

channel without a big investment in market recognition and lower transaction costs. On the other hand, securitization opens radically new financing possibilities for private banks which have been excluded from market access in the past. To analyze these alternatives we consider two different proxies:

*InAssets*: Larger banks are more likely to encounter lower transaction costs of accessing financial markets and, thus, they be more likely to securitize.

*Savings* and *Coop*: Savings banks and credit cooperatives had very restricted access to financial markets before securitization. Therefore, they are more likely to find securitization attractive. These two dummy variables take the value of 1 if the bank is a savings bank or a credit cooperative and zero otherwise. We expect a positive coefficient if the hypothesis that securitization enables firms to reduce the costs of adverse selection holds in the data.

#### 4.1.5 OTHER CONTROL VARIABLES

These variables aim to capture whether the decision of banks to securitize has been driven by other securitization determinants, such as the possibility to manage credit risk in their portfolios or to perform regulatory capital arbitrage. We consider three proxies:

(i) *NPL*: The ratio of non-performing loans over total loans (*NPL*) in bank portfolios reveals their credit standards and levels of accumulated risk. We expect banks with a higher *NPL* to have riskier loans and stronger incentives to transfer those risks to investors via securitization.<sup>22</sup>

(ii) *RegCap*: A dummy variable that takes the value of 1 if the Basel regulatory capital ratio is below the 25<sup>th</sup> percentile of the distribution and zero otherwise.<sup>23</sup> The regulatory capital ratio is computed by dividing regulatory capital (the portion of capital eligible to fulfill the capital requirements of the Basel Committee) by bank assets weighted according to their risk (Risk Weighted Assets or *RWA*). Banks closer to the regulatory limit, which is set at 8% in the Basel requirements, can find useful to use ABS/MBS as an instrument to ensure regulatory compliance.

(iii) *Mortg/Loans*: Mortgages are the most common underlying asset used in securitizations. Therefore, the weight of mortgage loans in a bank balance sheet controls for the possibility that banks with a higher proportion of mortgages securitize more often.

## 4.2 Empirical strategy and results

We perform three sets of tests. First, we estimate two alternative specifications of a Probit model to investigate the determinants of the banks' decision to securitize (i.e., the "extensive margin"). We examine both the year-to-year decisions to securitize (with a panel dataset of bank conditions) and the decision to securitize at least once during the post-securitization period (with a cross sectional dataset of the initial conditions of banks at the start of this period). We consider this second estimation approach to account for the possibility that the decision to securitize is part of a long-term financial strategy and then require several years for its full implementation. Second, we estimate a Tobit model to analyze the determinants of the

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<sup>22</sup> If riskier loans require more bank monitoring, this opposite effect may reduce the incentives to securitize high risk loans.

<sup>23</sup> As discussed below, we consider alternative definitions of this variable including other cut-off values.

amount of assets securitized by banks (i.e., the “intensive margin”), also considering the two estimation approaches used for the Probit model. Finally, we estimate duration models for the decision to securitize and explore which variables determine the speed at which a bank decides to securitize for the first time.

#### 4.2.1 RESULTS ON THE DECISION TO SECURITIZE

Table 4 presents the marginal effects of the Probit regressions, which are estimated with robust standard errors clustered at the bank level. Columns (1) and (2) display results for the Probit models that relate the decision of securitizing at least once during the 1999-2006 period to the values on year 1999 of the proxy variables for the determinants of securitization. The year 1999 is the first when securitization became available to banks. Column (1) includes all the financing alternatives relative to the volume of loans (*Dep/Loans*, *Interbank/Loans*, *Debt/Loans*, *Equity/Loans*) and column (2) replaces these variables with *Concentration*. As shown in (1) while other financial cost proxies are not statistically significant, the coefficient of *Dep/Loans* is negative and statistically significant in (1) which suggests that banks with lower relative marginal cost for deposits at the beginning of the securitization year are less likely to securitize during that period. In (2) *Concentration* has the expected negative sign but fails to be statistically significant.

Banks with a higher stock of liquid assets with respect to loans (*Liquidity/Loans*) in 1999 are less likely to securitize. However, we do not find evidence that internally generated funds from past profits (*Past Profit/Loans*) reduce the incentives to securitize.

The coefficient on *Projected Loan Growth* is positive and highly significant which indicates that banks used securitization to fund credit growth, in line with preliminary evidence in Figure 3. Securitization is associated with a substantial increase in the growth rate of banks’ balance sheets, which increased from 8.9% per annum during the *pre-securitization* years to 14.0% during the *post-securitization* period.

There is also a positive and significant coefficient for *InAssets*, suggesting that large banks with an existing record of operations in financial markets can gain access to securitization. In addition, we find evidence that, other things equal, savings banks and credit cooperatives are more likely to securitize than commercial banks. This result is consistent with the hypothesis that securitization can reduce adverse selection problems if groups of banks can jointly issue bonds backed by a common loan portfolio.

As for other control variables, there is no evidence that Spanish banks used securitization as a risk management tool (i.e., to mitigate and transfer credit risk) or as a mean to engage in regulatory capital arbitrage. This result could be explained by the tougher regulation on conduits and SIV (Structured Investment Vehicles) in Spain, which was precisely designed to limit off-balance sheet risks and regulatory capital arbitrage.<sup>24</sup>

Columns (3) and (4) provide results for the Probit models that relate the decision of securitizing at least once during the period 1999-2002 to the situation of the banks in 1999. The results are similar to the estimates in (1) and (2), suggesting that the banks that securitized during the period 1999-2006 already made the decision to securitize during the initial sub-period 1999-2002.

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<sup>24</sup> Acharya, Schnabl and Suarez (2013) study conduits as a case of “regulatory arbitrage”, and they notice that banks based in Spain and Portugal did not set up conduits.

Columns (5) and (6) show the estimates obtained with the panel data of year to year securitization decisions. In these models, the bank decision to securitize in year  $t$  is explained by the value of explanatory variables in year  $t-1$ . The qualitative results are similar to the previous estimations in columns (1) to (4), though the magnitude of the coefficients is generally smaller. The variable *Interbank/Loans* becomes statistically significant, but *Dep/Loans* loses its significance and none of the other financial cost proxies is significant in (5). As stated above, these weaker findings could be the result of the time frame for the decision to securitize. Securitization choices would not be made on a yearly basis, but they would rather form part of medium to long-term financial strategy.

We perform a number of tests to evaluate the robustness of the above results. First, we consider additional growth proxies as explanatory variables. Therefore, as alternative controls of bank growth possibilities, we include: (i) the (weighted) GDP growth of all the regions where a bank operates and (ii) a dummy variable that identifies banks opening branches in new regional markets. We expect that banks will have higher growth opportunities if they operate in regions with high economic growth or they have entered new markets. The coefficient for weighted GDP growth is significant at the 5% level if this variable is the only control for growth opportunities in the model for the decision to securitize. If both weighted GDP growth and the dummy identifying new entrants are included, the coefficient on the former variable is only significant at the 10% level. The dummy identifying new entrants is not significant even when included as the single proxy for growth possibilities. When we include these two proxies together with *Projected Loan Growth*, the latter variable is significant at the 5% level whereas the weighted GDP growth and the dummy for new entrants are found to be not significant. Thus, we interpret that the three variables are capturing a common effect, and that *Projected Loan Growth* captures all the relevant information contained in the other two variables.

For the panel data models, we also consider two additional dummy variables as proxies for access to financial markets: (i) a dummy for banks listed in the stock market and (ii) a dummy for banks that have issued at some point in time debt instruments in wholesale markets. The results show positive and significant coefficients for these variables, in line with the predictions of theoretical models. Nevertheless, these variables are not included in the main analysis because they are highly correlated with the identity of some banks, creating an overfitting problem (i. e., perfect predictions for some banks) in the regressions for the decision to securitize.

#### 4.2.2 RESULTS ON THE AMOUNT SECURITIZED

Table 5 displays results for the models of the asset amounts securitized by Spanish banks (i.e., the “intensive margin”), which are estimated with a Tobit specification with standard errors robust to heteroskedasticity and clustering at bank level. The dependent variable is the amount of funds securitized by a bank normalized by the size of its assets, but the results presented in Table 5 still follow the same structure as the estimates of the Probit models in Table 4. The explanatory variables are the same as in the Probit analysis of subsection 4.2.1. For columns (1) and (2), the dependent variable is the amount of funds securitized by a bank during the whole 1999-2006 period (normalized by the size of its assets in 2006) and explanatory variables are fixed at their values on year 1999. Columns (3) and (4) present results for specifications analogous to (1) and (2), but with a shorter time horizon from 1999 to 2002. Columns (5) and (6) correspond to the results from panel data estimation, which uses the amount securitized on year  $t$  as dependent variable and the proxies on year  $t-1$  as explanatory variables.

Comparing the coefficients of the explanatory variables on Table 4 and Table 5, we observe that the proxies for liquidity, growth opportunities and market access maintain their sign and statistical significance. These determinants of the securitization decision have a comparable qualitative impact on the intensive and extensive margins.

The conclusions about the effect of financial costs are also comparable in Table 4 and Table 5, but not all the coefficients for this sub-set of variables are equal across specifications. In Table 5, evidence of the effect of financial costs on securitization is supported by the negative and statistically significant coefficients of *Interbank/Loans* and *Equity/Loans* in columns (1) and (3) (instead of *Dep/Loans* as in Table 4) and *Dep/Loans* and *Interbank/Loans* in column (5) (instead of only *Interbank/Loans* as in Table 4). Finally, other control variables do not have a significant effect on the amount securitized, as it was the case for the decision to securitize.

#### 4.2.3 RESULTS FROM DURATION ANALYSIS

Table 6 presents estimates of the duration models, which assume that the time elapsed until a bank securitizes for the first time is governed by a parameterized hazard rate. The function  $h(t, X)$  for the hazard rate is defined as the product of a common time factor and a function of bank level variables that captures observed heterogeneity across banks, i.e.,  $h(t, X) = h_0(t) \cdot e^{X_i\beta}$ . Columns (1) and (2) in Table 6 report results for an exponential model with a constant conditional probability of securitization over time,  $h(t, X) = e^{X_i\beta}$ , while estimates in columns (3) and (4) correspond to a Weibull model. This alternative specification assumes a monotonic dependence of the hazard rate on time,  $h(t, X) = \rho t^{\rho-1} e^{X_i\beta}$ . The probability to securitize increases (decreases) over time if  $\rho > 1$  ( $\rho < 1$ ), whereas  $\rho = 1$  implies the reversion to the base exponential model. The results are presented in the form of exponential coefficients (i.e.,  $e^{\beta}$ ), which can be directly interpreted as increases in the baseline hazard rate.<sup>25</sup>

When we allow for time dependency of the hazard rate, we observe that the probability to securitize increases over time: the estimates of  $\rho$  are 1.9 and 1.91 in the Weibull specifications in columns (3) and (4). This result is consistent with the increasing number of securitizations over time reported in Table 1. The sign and magnitude of the coefficients of bank level variables are not significantly affected by the assumption of time dependence of the hazard rate. We thus provide unified comments on these coefficients for the specifications with and without time dependence.

We observe that a higher deposit base (*Dep/Loans*) is associated with a longer time until first securitization, which is an outcome consistent with the results for the Probit and Tobit models. The coefficients on the *Concentration* variable in columns (2) and (4) are positive and similar in size, though we only observe a significant result in the Weibull specification. A high value of *Concentration* or *Dep/Loans* implies strong reliance on a single financing source during the pre-securitization period and, given the estimated coefficients, a longer period of time until the first securitization. These results for *Dep/Loans* and *Concentration* support again the hypothesis that a large base of a pre-existing financing

<sup>25</sup> For instance,  $e^{\hat{\beta}_k} = 1.2$  implies that an increase in 1 unit in  $X_k$  leads to an increase of the baseline hazard rate by 1.2 and a decrease in the expected time to securitize. On the contrary,  $e^{\hat{\beta}_k} < 1$  implies that an increase in 1 unit in  $X_k$  lengthens the amount of time until the bank securitizes.

source is associated with a low relative financial cost of that source and therefore a lower probability of using new financing alternatives.

Other variables with significant coefficients include *Projected Loan Growth*, *Savings*, *Coop* and *lnAssets*. All of these variables receive coefficients higher than 1 and an increase in the value of one of them reduces the expected time until the first securitization. This result is consistent with the positive relation found between these variables and the decision to securitize, as reported in Table 4 and Table 5.

In order to evaluate the predictive power of the duration models, we present in Figure 4 the distribution across banks of the predicted number of years until first securitization. The specification in Column (3) of Table 6 is used to produce the predictions. We present separately the distributions of securitizing and non-securitizing banks. The model predicts a lower number of years until first securitization for banks that actually securitized. The distribution for this type of banks is concentrated around values below 5 years: 63% and 93% of the cases for securitizing banks receive respectively predictions below 5 and 10 years. For non-securitizing banks, the distribution is more dispersed and the time until first securitization is predicted larger than 10 years for 78% of the cases, which is out of the temporal scope of the sample.

Empirical analysis based on different models and estimation techniques provides evidence consistent with some key theoretical predictions. More specifically, banks are found to be more likely to securitize when the costs of alternative sources of funds are higher, growth opportunities are higher and the proportion of liquid assets held in balance sheets is lower. There is also evidence that savings banks and credit cooperatives are more likely to make early use of securitization than commercial banks. We argue that the reason for this latter result is that securitization grants these banks with a form of access to financial markets that was not previously available to them. In the next section, we provide further analysis to of the link between the access to financial markets through securitization and the reduction of costs related to asymmetric information.

## 5 Securitization and the pecking order of financing choices

In this section, we further investigate the hypothesis of whether securitization particularly affects banks that bear high informational costs to access capital markets. Specifically, we examine how securitization fits in the pecking order of financing choices by banks. To examine the securitization decision we build on the analysis of Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) and Bharath et al. (2009) and consider whether banks are likely to first choose securitization over other sources of funds and whether this effect is more pronounced when they face more severe adverse selection problems.

Our analysis modifies the conventional pecking order equation in previous empirical corporate finance to adapt it to the case of bank securitization. In a typical corporate finance case, the basic test examines whether a firm's financial deficit ( $FD$ ) can explain the increase of its debt ( $\Delta D$ ).<sup>26</sup> More specifically, the typical study is to estimate a regression of the form:  $\Delta D_{it} = \alpha + \beta FD_{it} + e_{it}$  and tests the hypothesis  $\beta=1$  (i. e., financial needs are covered only by issuing new debt).

Similarly we estimate a regression of the amount of (new) securitized loans on the bank's financial deficit ( $FD$ ). For bank  $i$  on year  $t$ , we define its financial deficit as:

$$FD_{it} = \Delta LOANS_{it} - \Delta DEPOSITS_{it} + \Delta INTERBANK_{it} + \Delta GOVBONDS_{it} + \Delta RESERVES_{it} + \Delta REST_{it} \quad [1]$$

where  $RESERVES$  consists of banks' reserves, including current profits, and the rest of variables have been defined in section 3. We then consider the following specification:

$$SEC_{it} = \alpha + \beta FD_{it} + e_{it} \quad [2]$$

and estimate  $\beta$  for different types of banks.

Following the insights in Bharath, Pasquariello and Wu (2009) we argue that firms are more affected by pecking order considerations at the time of issuing new securities if adverse selection problems are severe. We also follow their specific methodology and include in the pecking order equation the interaction of  $FD$  with a measure of asymmetric information. Specifically, we interact the variable  $FD$  with three indicator variables:  $Small$ ,  $Savings$  and  $Coop$ , which identify respectively small banks, savings banks and credit cooperatives. We define a bank as small if its total assets fall below the 30<sup>th</sup> percentile of the sample distribution of bank assets. In particular we estimate:

$$SEC_{it} = \alpha_0 + \alpha_1 Small_{it} + \alpha_2 Savings_i + \alpha_3 Coop_i + \alpha_4 Savings_i \cdot Small_{it} + \alpha_5 Coop_i \cdot Small_{it} + \beta FD_{it} + \gamma FD_{it} \cdot Small_{it} + \delta_1 FD_{it} \cdot Savings_i + \delta_2 FD_{it} \cdot Coop_i + e_{it} \quad [3]$$

and test the hypotheses:  $\gamma > 0$ ,  $\delta_1 > 0$ , and  $\delta_2 > 0$ . Intuitively, the coefficient on  $FD$  is expected to be higher for small and non-listed banks, which are thought to finance a higher proportion of their financial deficit through the issuance of securitized loans.

<sup>26</sup> The previous literature usually rejects the null hypothesis of  $\beta=1$  (Shyam-Sunder and Myers, 1999; Frank and Goyal, 2003; Fama and French, 2005) and finds values estimates of beta smaller than 1. Empirical evidence shows that firms typically combine the issuance of debt and capital to finance their financial deficits.

Table 7 presents our estimates for the sample of banks with a positive financial deficit. We report robust standard errors that are corrected for clustering at the bank level. The first column of Table 7 shows the results of the base specification in [2]. We find that  $\beta < 1$ , which implies the rejection of a strict (and more narrow) version of the pecking order hypothesis. Column (2) in Table 7 presents the results for a specification that includes the interactions of *FD* with the indicators *Savings* and *Coop*. For credit cooperatives, we obtain a positive coefficient on the interaction with *FD*, which is significant at the 5% level. Specification in column (3) includes the interaction *FD·Small*, which also has a positive and significant coefficient. To disentangle the effects of size and legal nature, the specification in column (4) includes all the previously used variables and additional interactions of *FD·Small* with the dummies for *Savings* and *Coop*. The results show that *FD*, *FD·Coop* and *FD·Savings·Small* receive statistically significant coefficients. These estimates suggest stronger preference for securitization among medium-large credit cooperatives and small savings banks. Indeed, credit cooperatives and small savings banks are candidates to face severe informational problems and restricted access to debt and equity markets. In summary, Table 7 provides suggestive evidence that this type of banks used securitization as a tool to reduce adverse selection costs and raise funds in wholesale financial markets.

As a robustness check, we use alternative thresholds for the definition of small banks. Thus, we define a bank as small if its size is smaller than the 5<sup>th</sup>, 10<sup>th</sup>, 20<sup>th</sup>, 40<sup>th</sup> and 50<sup>th</sup> percentiles of the distribution of the banks' assets, as alternative limits to the 30<sup>th</sup> percentile used in Table 7. Estimation of specification (4) in Table 7 is then repeated with the redefined *Small* indicators. The results on the coefficients of *FD* and *FD·Coop* are not sensitive to the definition of *Small*. However, the coefficient of *FD·Savings·Small* is not significant if the size threshold used for *Small* is lower than the 15<sup>th</sup> percentile or higher than the 50<sup>th</sup> percentile.



## 6 Conclusions

Securitization enables banks to shift from a traditional business model financed through the expansion of deposits to new business models that rely on the demand for securitized assets in international financial markets. In this study we find that securitization is also associated with substantial changes in the capital structure and funding policies of banks, in particular a substantial reduction in their reliance on deposits as a financing source. In addition, securitizing banks are observed to increase their loan volumes and their ratios of loans over total assets, whereas they decrease their holdings of low-return liquid assets.

The transition to a more market-dependent financing model has enabled banks to decouple the evolution of their credit activity from the capacity to raise deposits. This financial development, however, has also increased the vulnerability of banks to shocks in the financial markets. Non-securitizing banks have maintained a high weight of deposits over total funds and they have been able to cope better with the higher financial constraints observed after the start of the crisis in 2007 (Cornett et al., 2011). In this study, we fail to find evidence that relates securitization to banks credit risk management or regulatory capital arbitrage. While this may be due to our particular sample, we are able by contrast to provide evidence that relates the banks' securitization choice to other financing choices made by banks in order to fund their credit expansions.

Our cross-sectional findings are also interesting and consistent with the idea that the benefits of securitization can be associated to certain bank characteristics that correlate with their capital structure choices. Our empirical analysis indicates a positive relation between securitization benefits and the presence of funding constraints on credit growth, which can take the form of high cost of financial alternatives or outright exclusion from financial markets. We find evidence that securitization can grant access to financial markets to banks that were previously excluded due to severe adverse selection problems. Securitization is higher in the pecking order of financing choices for these financially constrained banks than for banks less affected by information asymmetries.

During recent years, securitization has been stigmatized because of its relation with the financial crisis initiated in 2007. The number of new issuances and the total volume of securitized loans have both drastically decreased, transforming banks' capital structures. Banks have been forced to either revert to the traditional deposit-based model or to rely on funds from central banks to fill in the funding gap left by the decrease in securitization activity. However, there are perspectives of a medium to long-term recovery in securitization markets (Bloommestein et al., 2011). The results in the current article suggest that there can be consequences associated to the elimination of securitization as a source of bank financing. In particular, if credit expansion by banks is a desirable policy objective, it may be necessary to provide alternative and flexible financing sources to banks, particularly to those institutions which find it more difficult issuing capital throughout the traditional forms of finance i.e., debt and equity.

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## Tables and figures

**Table 1. Number of banks, Securitized banks and Volume of Securitization**

	Total Number of Banks			Number of Banks that Securitize at <i>t</i>			Perc. Banks that Securitize at <i>t</i> (%)			Balance of Securitization (mill€)		
	Comm. Banks	Savings Banks	Credit Coop.	Comm. Banks	Savings Banks	Credit Coop.	Comm. Banks	Savings Banks	Credit Coop.	Comm. Banks	Savings Banks	Credit Coop.
1999	72	48	92	7	17	3	9,7	35,4	3,3	10.434	11.182	190
2000	68	46	90	9	13	3	13,2	28,3	3,3	16.067	11.101	343
2001	66	45	88	10	33	11	15,2	73,3	12,5	17.088	21.378	572
2002	61	45	84	10	30	10	16,4	66,7	11,9	30.632	33.150	1.378
2003	57	45	83	11	39	16	19,3	86,7	19,3	48.550	57.486	3.368
2004	54	45	83	20	41	17	37,0	91,1	20,5	80.763	77.472	6.901
2005	52	45	83	20	44	22	38,5	97,8	26,5	115.345	122.122	11.133
2006	51	45	83	22	43	24	43,1	95,6	28,9	161.526	179.870	16.242

**Table 2: Balance sheet of the Spanish Banking system**

**A. Volumes (Billions of Euros)**

Billions €	ASSETS				LIABILITIES			
	LOANS	INTERBANK	GOV BONDS	REST	DEPOSITS	DEBT	OWN FUNDS	SEC
1988	156.63	10.70	50.16	23.99	203.25	12.23	26.00	0.00
1989	178.77	16.07	59.61	22.87	237.76	11.00	28.55	0.00
1990	203.07	-3.11	68.15	45.90	268.91	10.98	34.13	0.00
1991	233.32	2.98	55.91	55.79	293.34	13.36	41.30	0.00
1992	255.01	-2.12	58.47	64.78	316.42	7.76	46.67	5.30
1993	267.49	11.01	64.67	74.87	348.43	9.41	52.80	7.40
1994	282.93	-1.29	85.69	77.31	373.00	11.12	53.19	7.32
1995	303.58	15.82	97.81	75.53	418.09	11.66	54.88	8.10
1996	332.33	9.20	104.91	76.42	441.93	15.17	57.62	8.14
1997	380.19	1.39	94.92	81.93	470.34	19.81	60.06	8.22
1998	435.30	-31.10	93.81	89.30	494.98	21.56	61.71	9.05
1999	493.03	-35.33	94.35	111.53	538.68	46.64	65.80	12.46
2000	605.71	-17.72	91.83	108.86	653.11	29.98	74.68	32.15
2001	648.01	-4.12	99.53	122.49	707.67	36.62	82.55	39.07
2002	720.14	-5.68	102.30	119.61	743.40	38.12	89.65	65.20
2003	824.55	-29.94	111.29	137.30	776.18	60.40	97.16	109.45
2004	972.32	-12.07	93.28	154.45	812.56	108.23	121.94	165.23
2005	1226.88	-34.57	92.73	199.43	930.60	167.01	138.11	248.75
2006	1526.40	17.85	74.10	186.26	1066.66	222.72	157.17	358.08

**B. Percentages of Total Assets**

Perc. of Assets	ASSETS				LIABILITIES			
	LOANS	INTERBANK	GOV BONDS	REST	DEPOSITS	DEBT	OWN FUNDS	SEC
1988	64.87	4.43	20.77	9.93	84.17	5.06	10.77	0.00
1989	64.47	5.79	21.49	8.25	85.74	3.97	10.30	0.00
1990	64.67	-0.99	21.70	14.62	85.63	3.50	10.87	0.00
1991	67.05	0.86	16.07	16.03	84.29	3.84	11.87	0.00
1992	67.80	-0.56	15.55	17.22	84.12	2.06	12.41	1.41
1993	63.99	2.63	15.47	17.91	83.35	2.25	12.63	1.77
1994	63.63	-0.29	19.27	17.39	83.89	2.50	11.96	1.65
1995	61.61	3.21	19.85	15.33	84.85	2.37	11.14	1.64
1996	63.56	1.76	20.07	14.62	84.52	2.90	11.02	1.56
1997	68.08	0.25	17.00	14.67	84.23	3.55	10.76	1.47
1998	74.12	-5.30	15.97	15.20	84.28	3.67	10.51	1.54
1999	74.30	-5.32	14.22	16.81	81.18	7.03	9.92	1.88
2000	76.80	-2.25	11.64	13.80	82.68	3.80	9.45	4.07
2001	74.84	-0.48	11.49	14.15	81.73	4.23	9.53	4.51
2002	76.91	-0.61	10.92	12.77	79.39	4.07	9.57	6.96
2003	79.04	-2.87	10.67	13.16	74.40	5.79	9.31	10.49
2004	80.49	-1.00	7.72	12.79	67.27	8.96	10.09	13.68
2005	82.65	-2.33	6.25	13.43	62.69	11.25	9.30	16.76
2006	84.58	0.99	4.11	10.32	59.11	12.34	8.71	19.84

**Table 3. Estimation of the relation between credit and deposit growth**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Total Banks		Total Banks		Securitizing Banks		Non-Securitizing Banks	
	1988-1991		2003-2006		2003-2006		2003-2006	
Deposit Growth	0.48 ***	0.35 ***	0.29 ***	0.19 ***	0.30 ***	0.27 ***	0.47 ***	0.23 ***
	(0.08)	(0.04)	(0.08)	(0.04)	(0.07)	(0.04)	(0.10)	(0.08)
GDP Growth	-3.60 ***	-0.73	4.71 ***	4.59 ***	6.21 ***	6.18 ***	6.04 *	6.56 **
	(1.07)	(0.78)	(1.25)	(1.04)	(1.70)	(1.50)	(3.57)	(3.33)
Intercept	0.23 ***	0.16 ***	-0.01	0.00	-0.04	-0.04	-0.12	-0.12
	(0.04)	(0.33)	(0.03)	(0.001)	(0.06)	(0.06)	(0.125)	(0.12)
Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
No. of Observ	578	578	743	743	433	433	307	307

Note. *Credit Growth* is the dependent variable in all the estimations. Symbols:  $p < 0.01 = ***$ ,  $p < 0.05 = **$ ,  $p < 0.1 = *$ . Standard errors are in parentheses.

**Table 4. Probit estimation of the decision to securitize**

	(1)	(2)	(3)	(4)	(5)	(6)
	1(Securitized 99-06)		1(Securitized 99-02)		Panel Estimation	
<i>Financial Cost Proxies</i>						
Dep/Loans	-0.226 ** (0.114)	-0.009 (0.053)	-0.247 ** (0.121)	-0.014 (0.055)	-0.059 (0.037)	-0.030 (0.023)
Interbank/ Loans	-0.491 (0.420)		-0.472 (0.429)		-0.358 *** (0.121)	
Debt / Loans	0.421 (1.359)		0.391 (1.448)		-0.074 (0.127)	
Equity / Loans	4.265 (2.863)		2.346 (1.862)		-0.448 (0.567)	
Concentration		-0.843 (0.702)		-0.825 (0.607)		-0.221 (0.143)
<i>Liquidity Proxies</i>						
Past Profitability / Loans	-4.770 (9.354)	1.925 (6.418)	-3.903 (9.758)	3.374 (6.488)	-1.635 (1.721)	-2.261 (1.726)
Liquidity / Loans	-1.309 * (0.731)	-1.398 *** (0.477)	-1.347 * (0.744)	-1.532 *** (0.534)	-0.561 *** (0.180)	-0.609 *** (0.153)
<i>Growth Proxies</i>						
Projected Loan Growth	23.485 *** (5.539)	18.393 *** (5.730)	25.961 *** (5.512)	21.356 *** (5.665)	2.967 ** (1.206)	2.748 ** (1.190)
<i>Access to Markets</i>						
Savings	0.576 *** (0.129)	0.489 *** (0.120)	0.629 *** (0.131)	0.545 *** (0.126)	0.392 *** (0.073)	0.449 *** (0.075)
Coop	0.695 *** (0.161)	0.661 *** (0.158)	0.738 *** (0.158)	0.706 *** (0.164)	0.200 *** (0.071)	0.299 *** (0.074)
ln Assets	0.288 *** (0.048)	0.201 *** (0.035)	0.307 *** (0.051)	0.216 *** (0.038)	0.122 *** (0.014)	0.123 *** (0.017)
<i>Bank Control Variables</i>						
Npl	0.293 (0.293)	0.292 (0.261)	0.355 (0.314)	0.319 (0.285)	9.210 (5.616)	9.649 * (5.778)
RegCap	0.001 (0.010)	-0.141 (0.261)	0.006 (0.282)	-0.124 (0.270)	0.009 (0.038)	0.017 (0.039)
Mortg/Loans	-0.572 (0.417)	-0.428 (0.393)	-0.645 (0.439)	-0.478 (0.416)	-0.131 (0.128)	-0.143 (0.137)
No. of Observations	195	195	202	202	1369	1369

Note. (1), (2)= The dependent variable is a dummy that takes the value of 1 if the bank has securitized at least once between 1999 and 2006 and zero otherwise. The explanatory variables refer to the value in 1999. (3), (4)=The dependent variable takes the value of 1 if the bank has securitized at least once between 1999 and 2002 and zero otherwise. The explanatory variables refer to the value in 1999. (5), (6)=The dependent variable takes the value of 1 if the bank has securitized in year  $t$  and zero otherwise; the estimation includes the time-dummy variables. The explanatory variables refer to the value in  $t-1$ . The robust standard errors corrected for clustering at the firm and bank level are in parentheses. Symbols:  $p < 0.01 = ***$ ,  $p < 0.05 = **$ ,  $p < 0.1 = *$ . Standard errors are in parentheses.

**Table 5. Tobit estimation of the amount securitized**

	(1)	(2)	(3)	(4)	(5)	(6)
	1(Securitized 99-06)		1(Securitized 99-02)		Panel Estimation	
<i>Financial Cost Proxies</i>						
Dep/Loans	-0.056 (0.069)	-0.014 (0.016)	-0.024 (0.025)	-0.010 (0.013)	-0.016 ** (0.008)	-0.011 ** (0.005)
Interbank/ Loans	-0.437 *** (0.142)		-0.166 ** (0.084)		-0.052 * (0.028)	
Debt / Loans	-0.171 (0.475)		-0.062 (0.367)		-0.023 (0.036)	
Equity / Loans	-0.844 ** (0.414)		-0.589 * (0.317)		0.078 (0.136)	
Concentration		-0.060 (0.099)		-0.113 (0.077)		-0.009 (0.022)
<i>Liquidity Proxies</i>						
Past Profitability / Loans	0.979 (3.627)	-0.649 (2.496)	1.541 (2.801)	0.097 (1.936)	-0.192 (0.332)	-0.016 (0.365)
Liquidity / Loans	-0.209 (0.258)	-0.323 ** (0.143)	-0.112 (0.149)	-0.164 (0.103)	-0.141 ** (0.055)	-0.138 *** (0.042)
<i>Growth Proxies</i>						
Projected Loan Growth	10.091 ** (4.294)	8.964 ** (4.437)	7.187 ** (3.506)	6.620 * (3.540)	1.015 *** (0.372)	0.978 *** (0.370)
<i>Access to Markets</i>						
Savings	0.062 ** (0.030)	0.110 *** (0.031)	0.057 ** (0.025)	0.066 ** (0.026)	0.038 *** (0.009)	0.045 *** (0.010)
Coop	0.032 (0.035)	0.106 *** (0.035)	0.022 (0.027)	0.057 ** (0.023)	0.012 (0.014)	0.023 (0.014)
In Assets	0.029 *** (0.009)	0.039 *** (0.009)	0.025 *** (0.007)	0.027 *** (0.007)	0.017 *** (0.002)	0.016 *** (0.002)
<i>Bank Control Variables</i>						
Npl	0.158 (0.137)	0.164 (0.142)	0.158 (0.115)	0.152 (0.113)	3.176 (1.930)	3.172 (1.952)
RegCap	-0.079 (0.084)	-0.091 (0.082)	-0.020 (0.062)	-0.017 (0.062)	-0.006 (0.007)	0.004 (0.008)
Mortg/Loans	0.050 (0.079)	0.065 (0.089)	-0.004 (0.074)	0.001 (0.071)	-0.015 (0.029)	-0.018 (0.031)
No. of Observations	195	195	202	202	1369	1369

Note. (1), (2)= The dependent variable is the ratio of the amount securitized during the period 1999-2006 with respect to assets in 2006 if the bank has securitized and zero otherwise. All of the estimations are robust to heteroskedasticity, and the standard errors are clustered at the bank level. The explanatory variables refer to the value in 1999. (3), (4)= The dependent variable is the ratio of the amount securitized during the period 1999-2002 with respect to assets in 2002 if the bank has securitized and zero otherwise. The explanatory variables refer to the value in 1999. (5), (6)=The dependent variable is the amount securitized in year  $t$  with respect to assets in  $t$  and zero otherwise; the estimation includes the time-dummy variables. The explanatory variables refer to the value in  $t-1$ . The robust standard errors corrected for clustering at the firm and bank level are in parentheses. Symbols:  $p < 0.01 = ***$ ,  $p < 0.05 = **$ ,  $p < 0.1 = *$ . Standard errors are in parentheses.

**Table 6. Duration Model: Number of years from 1998 to securitization**

	(1)	(2)	(3)	(4)
	Exponential		Weibull	
<i>Financial Cost Proxies</i>				
Dep/Loans	0.994 *	0.996	0.994 *	0.996
	(-1.68)	(-1.46)	(-1.75)	(-1.44)
Interbank/ Loans	0.983		0.980	
	(-1.41)		(-1.62)	
Debt / Loans	1.005		1.000	
	(0.23)		(-0.01)	
Equity / Loans	0.985		0.965	
	(-0.38)		(-0.84)	
Concentration		0.989		0.984 *
		(-1.19)		(-1.81)
<i>Liquidity Proxies</i>				
Past Profitability / Loans	0.995	1.006	0.999	0.985
	(-0.05)	(0.07)	(-0.01)	(-0.15)
Liquidity / Loans	1.009	1.007	1.011	1.009801
	(0.90)	(0.75)	(1.16)	(1.03)
<i>Growth Proxies</i>				
Projected Loan Growth	1.785 ***	1.710 ***	1.928 ***	1.833 ***
	(4.09)	(3.84)	(4.35)	(4.09)
<i>Access to Markets</i>				
Savings	2.865 ***	3.123 ***	3.987 ***	4.635 ***
	(2.90)	(3.18)	(3.48)	(3.90)
Coop	3.073 ***	4.011 ***	3.834 ***	5.356 ***
	(3.07)	(4.07)	(3.56)	(4.75)
In Assets	1.596 ***	1.574 ***	1.819 ***	1.778 ***
	(5.62)	(5.54)	(6.69)	(6.50)
<i>Bank Control Variables</i>				
Npl	0.998	0.998	0.997	0.997
	(-0.50)	(-0.50)	(-0.68)	(-0.78)
RegCap	1.643	1.855	1.298	1.787
	(1.10)	(1.48)	(0.55)	(1.33)
Mortg/Loans	1.008	1.009	1.009	1.010
	(0.85)	(0.98)	(0.94)	(1.00)
<i>p</i>			1.903 ***	1.912 ***
No. of Observations	211	211	211	211

Note. (1), (2) = The exponential model, hazard rate is constant over time (3), (4)= Weibull model, hazard rate is monotonic if  $p \neq 1$ . Symbols:  $p < 0.01 = ***$ ,  $p < 0.05 = **$ ,  $p < 0.1 = *$ . The results are presented in the form of exponential coefficients, that is,  $e^{\beta}$  because they can be directly interpreted as the increases in the baseline hazard rate. *t*-ratios in parentheses.



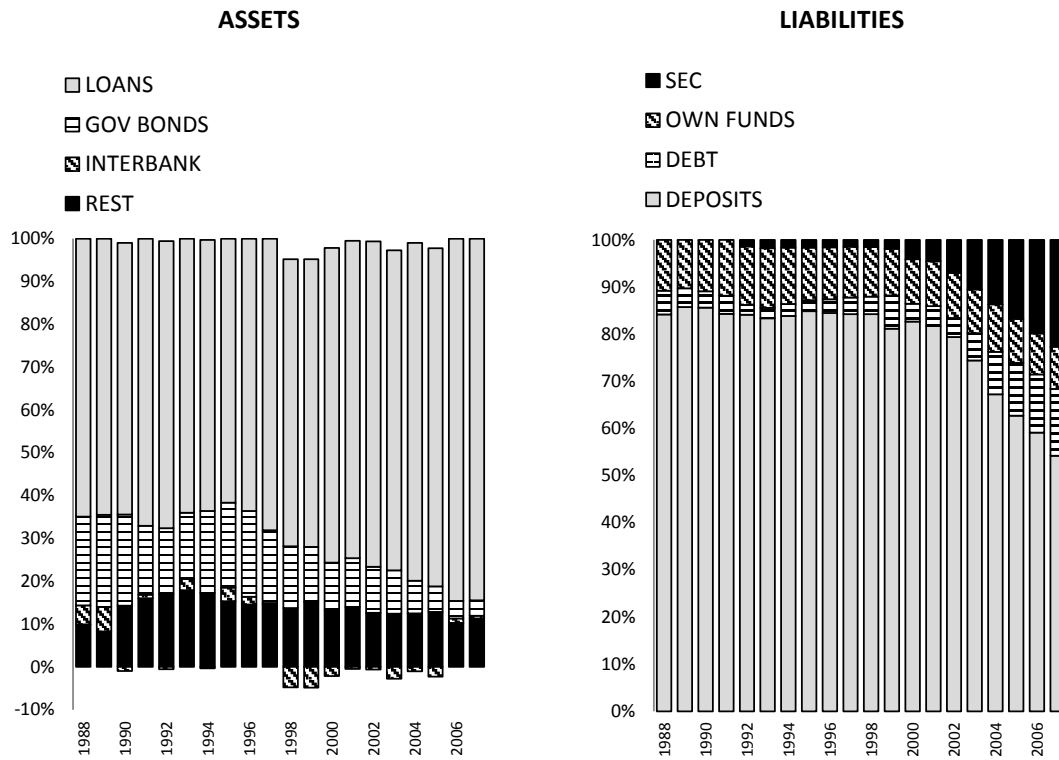
**Table 7. Estimation of the Pecking order Equation**

	Dependent variable: $SEC_t$			
	(1)	(2)	(3)	(4)
<i>FD</i>	0.560 *** (0.063)	0.571 *** (0.105)	0.559 *** (0.064)	0.573 *** (0.107)
<i>FD·Savings</i>		-0.025 (0.133)		-0.031 (0.136)
<i>FD·Coop</i>		0.216 ** (0.106)		0.214 ** (0.108)
<i>FD·Small</i>			0.260 *** (0.092)	-0.263 (0.285)
<i>FD·Savings·Small</i>				0.528 * (0.309)
<i>FD·Coop·Small</i>				-0.113 (0.394)
<i>Savings</i>		124,249 * (65,645)		162,538 * (90,510)
<i>Coop</i>		34,257 (35,324)		44,864 (46,704)
<i>Small</i>			-23,701 (27,768)	44,917 (46,696)
<i>Savings·Small</i>				-159,200 * (90,750)
<i>Coop·Small</i>				-45,328 (46,714)
<i>Intercept</i>		-34,353 (35,311)	22,613 (27,740)	-44,764 (46,687)
$R^2$	85.04	85.38	85.05	85.48
No. of Observ	813	813	813	813

Note. *SEC* is the volume of securitized assets issued by a bank at  $t$ , and *FD* is the financial deficit of the bank defined in [1]; *Small* is a dummy variable that identifies banks with assets below the 30<sup>th</sup> percentile of the asset distribution of banks of the same legal nature; *Savings* and *Coop* are dummy variables that identify the savings banks and credit cooperatives, respectively. OLS are estimations with the standard errors clustered at the bank level. Symbols:  $p < 0.01 = ***$ ,  $p < 0.05 = **$ ,  $p < 0.1 = *$ . Standard errors in parentheses.

**Figure 1. Evolution of Banks' Capital Structure**

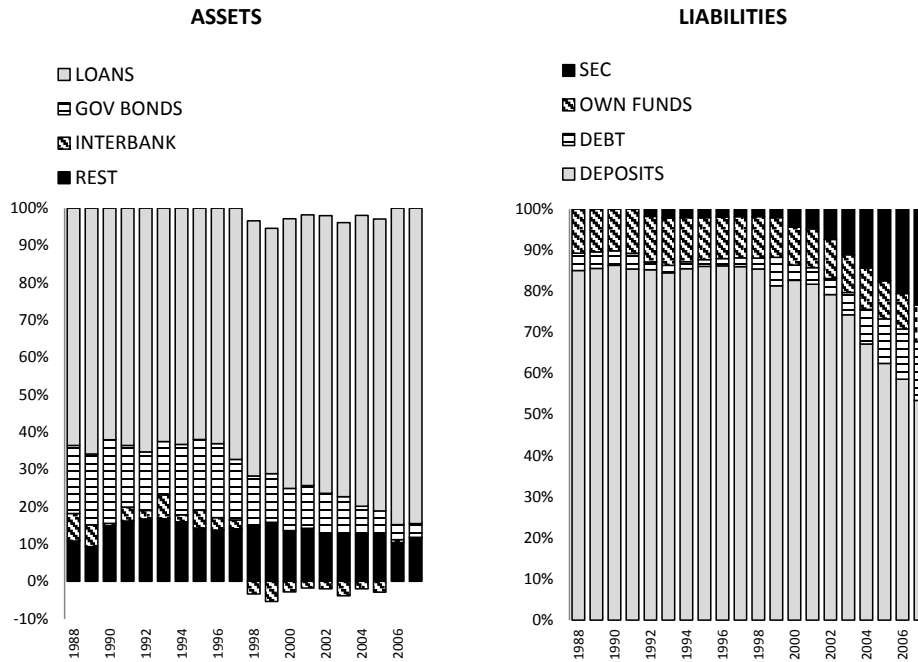
**Total Banks**



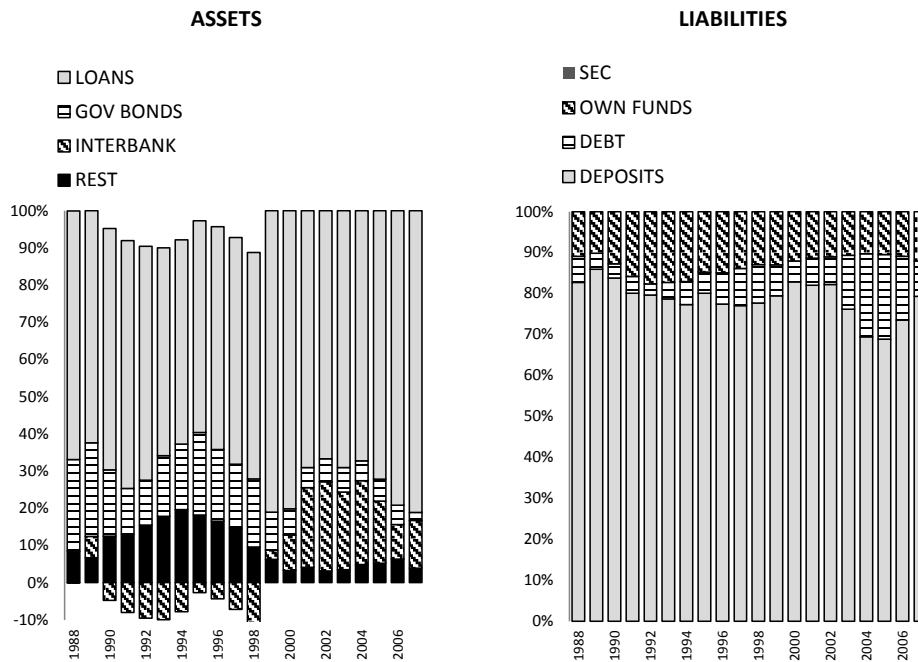
Note. The plot ASSETS displays the relative weights of *LOANS*, *GOV BONDS*, *INTERBANK* and *REST* with respect to total bank assets. The plot LIABILITIES displays the relative weights of *SEC*, *OWN FUNDS*, *DEBT* and *DEPOSITS* with respect to total bank liabilities.

**Figure 2. Evolution of Banks' Capital Structure.**

**2A. Banks that do securitize**



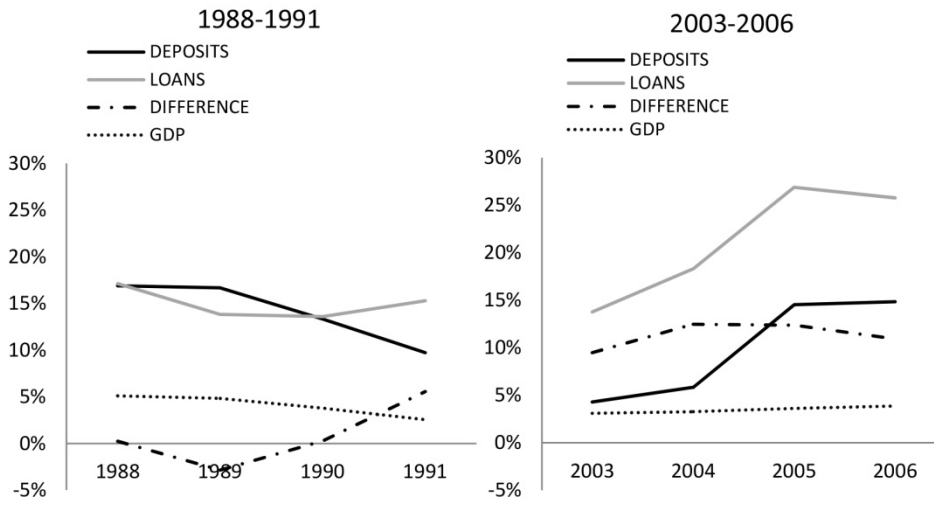
**2B. Banks that do not securitize**



Note. The plot ASSETS displays the relative weights of *LOANS*, *GOV BONDS*, *INTERBANK* and *REST* with respect to total bank assets. The plot LIABILITIES displays the relative weights of *SEC*, *OWN FUNDS*, *DEBT* and *DEPOSITS* with respect to total bank liabilities.

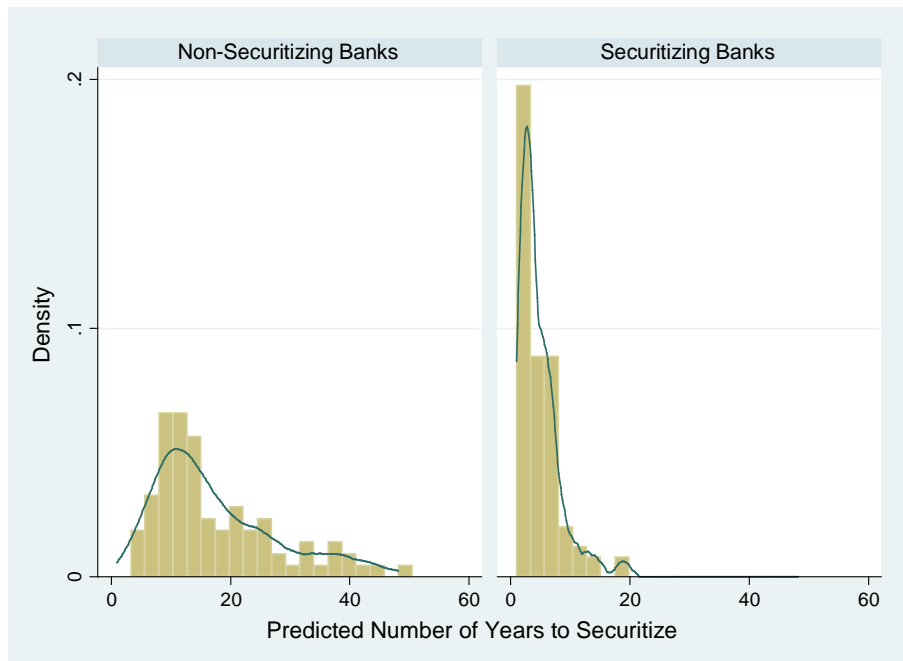
**Figure 3. Evolution of growth rates of loans and deposits.**

**Total Spanish Banks**



**Figure 4. Density of the prediction of the number of years until securitization**

**Total Spanish Banks**



## APPENDIX. Homogenization of the concepts in the variables *LOANS* and *DEPOSITS*

This paper gathers different items of the asset and liability sides of the balance sheet in the following aggregate concepts:

$$\text{Assets} = \text{Loans} + \text{Net Interbank} + \text{Government Debt} + \text{Others (net)}$$

$$\text{Liabilities} = \text{Own Funds} + \text{Securitization} + \text{Deposits} + \text{Debt}$$

Most of the items (net interbank, government debt, own funds, debt, securitization) are obtained directly from the information in the balance sheet. However, loans and deposits require certain adjustments.

For loans, adjustments are made to address a regulatory change introduced at the end of 2004 (CBE 4/2004). Prior to 2004, CBE 4/1991 established that securitized loans were to be written off the balance sheets of banks. With the new regulation in CBE 4/2004, banks could only write off a securitized loan if securitization implied an effective transfer of the risk of that loan. Additionally, the new regulation introduced in 2004 had a retroactive effect, and it obliged banks to include again in their balance sheets those loans securitized in the past that did not comply with the new criteria of risk transfer. As a consequence, there was a break in the series of outstanding loans in year 2005, with approximately 90% of the securitized loans made in the past returning to banks' balance sheets. In order to homogenize these series, we adopt the criterion of the CBE 4/2004. We compute the percentage of off-balance sheet loans that returns to balance sheets in 2005 and extend this percentage to the previous years of the sample (1999-2004). Therefore, the variable *LOAN* will be equal to the accounting item for total loans from 2005 onwards. *LOAN* will include both total loans in the balance sheet and the computed proportion of securitized assets before that year.

For deposits, Spanish accounting regulation establishes that the liability counterparty of an operation of securitization is accounted for in the deposit item of the balance sheet. However, we consider a more refined definition of deposits (i.e., funds collected from consumers in the retail business of banks) and separate them from securitization. To accomplish this, we define *DEPOSITS* as the difference between the deposit item of the balance sheet and the outstanding amount of securitized assets *SEC*.

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